

REMARKS

Claims 1-12, 14-27, 39-46, 48-66, 68-79, 83-84 and 86-89 remain in this application. Claims 13, 28-38, 47, 67, 80-82, 85 and 90-94 have been canceled. Claims 1, 14, 15, 39, 46, 48-50, 78-79, 83-84 and 88 have been amended. The amendments for the most part consist of incorporating limitations formerly found in the dependent claims into a base claim, and canceling claims that have been thereby made redundant. In a few claims, typographical errors have been corrected. By these amendments, no new matter has been added.

The Examiner objected to the drawings under 37 C.F.R. § 1.83, as not showing all five options defined by Claim 92. This objection is respectfully traversed. Moreover, Claim 92 has been canceled, and this objection is therefore moot, and should be withdrawn.

It is hoped that the following summary of certain aspects of the invention in respect of the remaining claims and the arguments advanced will be helpful to the Examiner. In embodiments of the invention, a spring contact structure is elevated above a substrate and a protruding member (which may act as a stop, an electrical switch, or both) by an elongate post component, or group of post components. Each elongate post component comprises a wire encased in a structural material, and may be formed by bonding a wire to the substrate, and then coating the wire with the structural material. One of the benefits of this structure is the ability to construct very small, fine-pitch spring contact structures that are elevated well above their support substrate, without any need to form a high aspect ratio post component using a lithographic (e.g., LIGA) approach. Thus, the invention may enable faster and/or more reliable fabrication of fine-pitch contacts on elevated posts.

In addition, or in the alternative in other embodiments of the invention, the protruding member also comprises a wire coated with a structural material. Again, this may facilitate the fabrication of upright, high-aspect ratio structures within fine-pitch microelectronic contact arrays, while avoiding the disadvantages of lithographic

fabrication for high aspect ratio upright structures.

In addition, or in the alternative in other embodiments of the invention, an elastic beam of the contact, a protruding member, and a tip structure on the beam are configured to provide a reverse wiping action to the contact tip. Various structures for providing reverse wipe are described in detail in the specification.

In addition, or in the alternative in other embodiments of the invention, an adjustable pressure device is disposed between the beam and support substrate of a spring contact. The adjustable pressure device comprises a mechanical actuator, such as a fluid-filled membrane, or a rotating cam. The mechanical actuator avoids the disadvantages of the electrical actuator in the prior art, which may interfere with the electrical performance of the contact tip, and may damage the device under test by a current or voltage surge, in case of an insulation failure.

The Examiner rejected Claims 1-94 under 35 U.S.C. § 103(a) over White in view of Fjelsted, Hagihara, Moran and Japan 4-214650 (Kawahara). These rejections are respectfully traversed.

Concerning Claim 1 and its dependent Claims 2-12 and 14-27, White fails to disclose or suggest at least the elongate post component "comprised of a wire core coated with a structural material," as defined by Claim 1. Similarly, Fjelsted, Hagihara, Moran and Kawahara each fail to disclose or suggest at least this feature.

Concerning Claim 39 and its dependent Claims 40-46, White fails to disclose or suggest at least the protruding member "comprising a wire core bonded to said substrate and encased in a structural material," as defined by Claim 39. Similarly, Fjelsted, Hagihara, Moran and Kawahara each fail to disclose or suggest at least this feature.

Concerning Claim 48 and its dependent Claims 49-66, White fails to disclose or suggest at least a tip structure that "is reverse wiped" when the spring structure is in a deflected position, as defined by Claim 48. Similarly, Fjelsted, Hagihara, Moran and Kawahara each fail to disclose or suggest at least this feature.

Concerning Claim 68 and its dependent Claims 69-77, White fails to disclose or suggest at least a beam with a "separately extending portion extending from said base portion [of the beam] in a direction different from said cantilever portion", and "an electronic device [e.g., a capacitor per Claim 71] connected to said separately extending portion of said beam and to said substrate," as defined by Claim 68. See Fig. 6, which shows an embodiment of Claims 68 and 71. Similarly, Fjelsted, Hagihara, Moran and Kawahara each fail to disclose or suggest at least this feature.

Concerning Claim 78 and its dependent Claims 79, 83-84, and 86-88, White fails to disclose or suggest at least "an adjustable pressure device disposed under said beam" comprising a "mechanical actuator," as defined by Claim 78. Similarly, Fjelsted, Hagihara, Moran and Kawahara each fail to disclose or suggest at least this feature.

Thus, White, Fjelsted, Hagihara, Moran and Kawahara each fail to disclose or suggest at least the features identified above. At least one of these features is present in every remaining independent claim. Accordingly, a *prima facie* showing of obviousness has not been properly made out against the remaining claims, and these rejections should therefore be withdrawn.

The Examiner rejected Claims 1-94 under 35 U.S.C. § 102(b), or in the alternative, 35 U.S.C. § 103(a), over Trenary, Hagihara, or Fjelsted. These rejections are respectfully traversed.

Concerning Claim 1 and its dependent Claims 2-12 and 14-27, Trenary fails to disclose or suggest at least the elongate post component "comprised of a wire core coated with a structural material," as defined by Claim 1. Similarly, Hagihara and Fjelsted each fail to disclose or suggest at least this feature.

Concerning Claim 39 and its dependent Claims 40-46, Trenary fails to disclose or suggest at least the protruding member "comprising a wire core bonded to said substrate and encased in a structural material," as defined by Claim 39. Similarly, Hagihara and Fjelsted each fail to disclose or suggest at least this feature.

Concerning Claim 48 and its dependent Claims 49-66, Trenary fails to disclose or

suggest at least a tip structure that "is reverse wiped" when the spring structure is in a deflected position, as defined by Claim 48. Similarly, Hagihara and Fjelsted each fail to disclose or suggest at least this feature.

Concerning Claim 68 and its dependent Claims 69-77, Trenary fails to disclose or suggest at least a beam with a "separately extending portion extending from said base portion [of the beam] in a direction different from said cantilever portion", an "an electronic device [e.g., a capacitor per Claim 71] connected to said separately extending portion of said beam and to said substrate," as defined by Claim 68. Similarly, Hagihara and Fjelsted each fail to disclose or suggest at least this feature.

Concerning Claim 78 and its dependent Claims 79, 83-84, and 86-88, Trenary fails to disclose or suggest at least "an adjustable pressure device disposed under said beam" comprising a "mechanical actuator," as defined by Claim 78. Similarly, Hagihara and Fjelsted each fail to disclose or suggest at least this feature.

Thus, Trenary, Hagihara and Fjelsted each fail to disclose or suggest at least the above-identified features, at least one of which is present in every one of the remaining independent claims. Accordingly, the Examiner has failed to make a *prima facie* showing under either 35 U.S.C. § 102(b), or 35 U.S.C. § 103(a), against the remaining claims. These rejections should therefore be withdrawn.

The Examiner rejected Claims 1-94 under 35 U.S.C. § 102(b), or in the alternative, 35 U.S.C. § 103(a), over Kawahara <sup>JAPAN</sup> alone or with Moran and Fjelsted. These rejections are respectfully traversed.

As discussed above, Kawahara and Fjelsted are plainly deficient with respect to each of independent Claims 1, 39, 48, 68, and 78.

Concerning Moran, with respect to Claim 1 and its dependent Claims 2-12 and 14-27, Moran fails to disclose or suggest at least the elongate post component "comprised of a wire core coated with a structural material," as defined by Claim 1. With respect to Claim 39 and its dependent Claims 40-46, Moran fails to disclose or suggest at least the protruding member "comprising a wire core bonded to said substrate and

encased in a structural material," as defined by Claim 39. With respect to Claim 48 and its dependent Claims 49-66, Moran fails to disclose or suggest at least a tip structure that "is reverse wiped" when the spring structure is in a deflected position, as defined by Claim 48. With respect to Claim 68 and its dependent Claims 69-77, Moran fails to disclose or suggest at least a beam with a "separately extending portion extending from said base portion [of the beam] in a direction different from said cantilever portion", an "an electronic device [e.g., a capacitor per Claim 71] connected to said separately extending portion of said beam and to said substrate," as defined by Claim 68. With respect to Claim 78 and its dependent Claims 79, 83-84, and 86-88, Moran fails to disclose or suggest at least "an adjustable pressure device disposed under said beam" comprising a "mechanical actuator," as defined by Claim 78.

Thus, Kawahara, Moran, and Fjelsted each fail to disclose or suggest at least the above-identified features, at least one of which is present in every one of the remaining independent claims. Accordingly, the Examiner has failed to make a *prima facie* showing under either 35 U.S.C. § 102(b), or 35 U.S.C. § 103(a), against the remaining claims. These rejections should therefore be withdrawn.

The Examiner rejected Claims 90 and 92 under 35 U.S.C. § 103(a) as obvious over Ueno. Claims 90-94 have been cancelled, and this objection is therefore moot. However, the "adjustable pressure device" feature formerly defined by Claim 90 is now defined by Claim 78. Applicants submit that this ground of rejection is not applicable to Claim 78 and its dependent claims. Ueno fails to disclose or suggest at least a "mechanical actuator." Electrodes 61, 62, shown in Fig. 5 of Ueno, comprise an actuator that operates by electrostatic force. This is distinct from the invention, and Ueno nowhere suggest that actuators other than the electrostatic type may be employed. Nor would one of ordinary skill find mechanical actuators to be obvious in view of Ueno. Mechanical actuators for activating individual microelectronic spring contacts represent a radical departure from prior art practices in the contactor art, and would not have been obvious. Mechanical actuators under the beams of

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microelectronic spring contacts were unknown, and almost unthinkable, prior to the present invention. This rejection should therefore be withdrawn.

In connection with Ueno, the Applicant respectfully requests that the Examiner provide more specific comments regarding the allowability of dependent Claims 83-84. It is noted that "mechanical actuator" is used in Claim 78 in a sense that includes fluid-activated elements such as the fluidic membrane defined by Claim 83.

In view of the foregoing, the Applicant respectfully submits that Claims 1-12, 14-27, 39-46, 48-66, 68-79, 83-84 and 86-89 are in condition for allowance. Reconsideration and withdrawal of the rejections is respectfully requested, and a timely Notice of Allowability is solicited. To the extent it would be helpful to placing this application in condition for allowance, the Applicant encourages the Examiner to contact the undersigned counsel and conduct a telephonic interview.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned **"Version with markings to show changes made."**

To the extent necessary, Applicants petition the Commissioner for a one-month extension of time, extending to October 17, 2002, the period for response to the Office Action dated June 17, 2002. The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-0639.

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Respectfully submitted,



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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**IN THE CLAIMS:**

Claims 13, 28-38, 47, 67, 80-82, 85, and 90-94 have been canceled.

Claims 1, 14, 15, 39, 46, 48-50, 78-79, 83-84, and 88 have been amended as follows:

1. (Amended) A microelectronic spring structure, comprising:
  - a substrate;
  - a beam, having a base portion, a cantilevered portion extending from said base portion, and a tip portion adjoining said cantilevered portion at an end thereof opposite to said base portion, said beam secured to said substrate at said base portion;
  - an elongate post component between said substrate and said beam, whereby said beam is spaced apart from and secured to said substrate, said post component comprised of a wire core coated with a structural material; and
  - a protruding member mounted to said substrate, and disposed under said cantilevered portion of said beam spaced apart from said tip portion;

wherein said microelectronic spring structure is reversibly deflectable between an undeflected position wherein the protruding member does not contact said beam, and a deflected position wherein said protruding member contacts said cantilevered portion of said beam at a position spaced apart from said tip portion.
14. (Amended) The microelectronic spring structure of Claim [13] 1, wherein said post component comprises a column element[, and said column element is comprised of a wire core coated with a structural material].
15. (Amended) The microelectronic spring structure of Claim [13] 1, wherein said post component comprises a group of column elements.

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39. (Amended) A microelectronic spring structure, comprising:  
a substrate;

Fig 7A 7B  
a beam, having a base portion, a cantilevered portion extending from said base portion, and a tip portion adjoining said cantilevered portion at an end thereof opposite to said base portion, said beam secured to said substrate at said base portion; wherein said beam is mounted to said substrate and said cantilevered portion thereof extends away from said substrate; and

a protruding member mounted to said substrate, and disposed under said cantilevered portion of said beam, said protruding member comprising a wire core bonded to said substrate and encased in a structural material;

wherein said microelectronic spring structure is reversibly deflectable between an undeflected position wherein the protruding member does not contact said beam, and a deflected position wherein said protruding member contacts said beam.

46. (Amended) The microelectronic spring structure of Claim 39, wherein said protruding member [comprises a wire bonded to said substrate] comprises a column, said column having a first end attached to said substrate, and a second end disposed under said beam above said substrate.



48. (Amended) A microelectronic spring structure, comprising:  
a substrate;

a beam, having a base portion, a cantilevered portion extending from said base portion, and a tip portion adjoining said cantilevered portion at an end thereof opposite to said base portion, said beam secured to said substrate at said base portion;

a protruding member connected to said beam, and disposed under said cantilevered portion of said beam; and

a tip structure for contacting a terminal of an electronic component, said tip structure mounted to and disposed above a surface of said beam opposite to said substrate;

wherein said microelectronic spring structure is reversibly deflectable between an undeflected position wherein the protruding member does not contact said substrate, and a deflected position wherein said protruding member contacts said substrate and said tip structure is reverse wiped.

49. (Amended) The microelectronic spring structure of Claim 48, [further comprising a] wherein said tip structure [for contacting a terminal of an electronic component, said tip structure mounted to and disposed above a surface of said beam opposite to said substrate] is located at a position intermediate between said base portion and said tip portion.

50. (Amended) The microelectronic spring structure of Claim [49] 48, wherein said tip structure is mounted to said tip portion of said beam.

78. (Amended) A microelectronic spring structure, comprising:

a substrate;

a beam, having a base portion, and a cantilevered portion extending from said base portion, said beam secured to said substrate at said base portion; and

an adjustable pressure device [a protruding member] disposed under said beam, wherein said adjustable pressure device comprises a mechanical actuator [protruding member is resilient and substantially compressible, and configured to be reversibly compressible between an equilibrium state wherein said protruding member is not compressed by any external contact force, and a compressed state wherein said protruding member is compressed between said beam and said substrate at least partially by an external contact force].

79. (Amended) The microelectronic spring structure of Claim 78, wherein said beam further comprises a free end distal from said base portion, said free end being reversibly deflectable perpendicularly towards said substrate through a first elastic range, and wherein said adjustable pressure device [protruding member] is reversibly compressible perpendicularly towards said substrate through a second elastic range no less than half of said first elastic range.

83. (Amended) The microelectronic spring structure of Claim [82] 78, wherein mechanical actuator [adjustable pressure device] comprises an elastic membrane enclosing a fluid.

84. (Amended) The microelectronic spring structure of Claim [82] 78, wherein mechanical actuator [adjustable pressure device] comprises an elastic membrane enclosing a fluid.

88. (Amended) The microelectronic spring structure of Claim [78] 86, wherein said post component comprises a column element, said column element comprised of a wire core coated with a structural material.